

Dear Dr. Sebastian van de Velde,

Thank you for your comments. Please find below respond to your comments and revised text.

Comment 1

1. Reviewer 2 has requested to add the oxygen sensor model (comment 8). 'Sea-Bird Scientific SBE 911 Plus CTD' is not the dissolved oxygen sensor. Please add the information about the oxygen sensor model.

Answer to comment 1:

The base model of the SBE 911 Plus CTD is equipped with the oxygen module SBE 43.

The information is added: "... equipped with oxygen module SBE 43..."

Comment 2

2. It is unclear what the p-values in Figs 4, 5, and 7 refer to (what was compared with what?). Please clarify in the caption.

Answer to comment 2:

The p-value presents a significant difference in the median concentration of the parameter between the fjords.

The information is added: "**Fig.4** Box plots of a) temperature (T), b) salinity (S), c) pH, d) oxygen (O_2), e) nitrate (NO_3^-), f) ammonium (NH_4^+), g) phosphate (PO_4^{3-}), h) dissolved silica (Si), i) dissolved inorganic carbon (DIC), j) dissolved organic carbon (DOC), k) total dissolved nitrogen (TN) and l) dissolved organic nitrogen (DON) in surface water (marked blue) and bottom water (marked orange) in Hornsund, Isfjorden, Kongsfjorden and Krossfjorden. The p-values indicate significant differences in the median concentration of the parameter between the investigated fjords."

"**Fig.5** a) Oxygen (O_2), b) pH, c) nitrate (NO_3^-), d) ammonium (NH_4^+), e) total dissolved nitrogen (TN), f) dissolved inorganic carbon (DIC), g) dissolved organic carbon (DOC), h) dissolved organic nitrogen (DON), i) dissolved silica (Si), and j) phosphate (PO_4^{3-}) in surface water (marked as blue), Arctic Water (marked orange), Winter-Cooled Water (marked green), Intermediate Water (marked pink), Local Water (marked dark grey), Transformed Atlantic Water (marked light grey) and Atlantic Water (marked red) in Hornsund, Isfjorden, Kongsfjorden and Krossfjorden. The p-values indicate significant differences in the median concentration of the parameter between the investigated fjords, presented only if statistically significant."

"**Fig.7** Box plots of a) chloride (Cl), b) nitrate (NO_3^-), c) ammonium (NH_4^+), d) phosphate (PO_4^{3-}), e) dissolved silica (Si), f) dissolved inorganic carbon (DIC), and g) dissolved organic carbon (DOC) in pore water (marked grey) and bottom water (marked orange) in Hornsund, Isfjorden, Kongsfjorden and Krossfjorden. The p-values indicate significant differences in the median concentration of the parameter between the investigated fjords."

Comment 3

3. The text does not reflect your response to comment 12 of Reviewer 2. Please add the information about whether the filters were pre-combusted to the text.

Answer to comment 3:

The information is added.

Comment 4

4. I agree with Comment 17 of Reviewer 2 that adding a table with the defining characteristics for each water mass (salinity and temperature ranges, see Cottier et al. 2005) would help with readability. Please consider adding a table.

Answer to comment 4:

The Table was added to the text:

“**Table 1.** Salinity and temperature of various water masses in Hornsund, Isfjorden and Kongsfjorden-Krossfjorden. The classification was done based on Cottier et al., (2005), Nilsen et al., (2008) and Promińska et al., (2018).”

	Hornsund (Nilsen et al., 2008)		Isfjorden (Nilsen et al., 2008)		Kongsfjorden-Krossfjorden (Cottier et al. 2005)	
	Temperature (°C)	Salinity	Temperature (°C)	Salinity	Temperature (°C)	Salinity
Arctic Water (ArW)	-1.5 > T > 2	34 < S < 34.5*	-1.5 > T > 1	34.4 < S < 34.8	-1.5 > T > 1	34.30 < S < 34.80
Atlantic Water (AW)	T > 3	S > 34.9	T > 3	S > 34.9	T > 3	S > 34.65
Intermediate Water (IW)	T > 1	34 < S < 34.7	T > 1	34 < S < 34.7	T > 1	34.00 < S < 34.65
Local water (LW)	T < 1		T < 1		-1.5 > T > 1	34.30 < S < 34.85
Surface Water (SW)	T > 1	34 < S	T > 1	34 < S	T > 1	S < 34
Transformed Atlantic Water (TAW)	T > 1	34.7 < S < 34.9	T > 1	S > 34.7	1 > T > 3	S > 34.65
Winter Cooled Water (WCW)	T < -0.5	S > 34.4	T < -0.5	S > 34.74	T < -0.5	34.40 < S < 35

*Promińska et al. (2018)

Comment 5:

5. In Fig. 2, you have a,b,c,d on the figure, but you do not refer to it in the caption, please do so.

Answer to comment 5:

Information added: “**Fig.1** a) Study Area including the general map of Spitsbergen, highlighting the depths of the fjords and the surrounding Svalbard shelf (a). The warm West Spitsbergen Current and cold East Spitsbergen Current are indicated by red and blue arrows, respectively (Vihtakari, 2022, 2020). Study sites located in b) Hornsund, c) Isfjorden, and d) Kongsfjorden and Krossfjorden are presented as black triangles..”

Comments 6:

6. in Figs 1, and 3-7, you do not use a, b, c, ... For clarity, it would help if you would consider adding a, b, ... on the figure and also in the captions.

Answer to comment 6:

Information added:

“Fig.1 a) Study Area including the general map of Spitsbergen, highlighting the depths of the fjords and the surrounding Svalbard shelf (a). The warm West Spitsbergen Current and cold East Spitsbergen Current are indicated by red and blue arrows, respectively (Vihtakari, 2022, 2020). Study sites located in b) Hornsund, c) Isfjorden, and d) Kongsfjorden and Krossfjorden are presented as black triangles.”

“Fig.2 The water masses distribution such as surface water (SW), Arctic Water (ArW), Winter-Cooled Water (WCW), Intermediate Water (IW), Local Water (LW), Transformed Atlantic Water (TAW) and Atlantic Water (AtW) in a) Hornsund, b) Isfjorden, c) Kongsfjorden and d) Krossfjorden.”

“Fig.3 Distribution of a) temperature (T), b) salinity (S), c) pH, d) oxygen (O_2), e) nitrate (NO_3^-), f) ammonium (NH_4^+), g) phosphate (PO_4^{3-}), h) dissolved silica (Si), i) dissolved inorganic carbon (DIC), j) dissolved organic carbon (DOC), k) total dissolved nitrogen (TN) and l) dissolved organic nitrogen (DON) in Hornsund (marked blue), Isfjorden (marked grey), Kongsfjorden (marked red) and Krossfjorden (marked yellow).”

“Fig.4 Box plots of a) temperature (T), b) salinity (S), c) pH, d) oxygen (O_2), e) nitrate (NO_3^-), f) ammonium (NH_4^+), g) phosphate (PO_4^{3-}), h) dissolved silica (Si), i) dissolved inorganic carbon (DIC), j) dissolved organic carbon (DOC), k) total dissolved nitrogen (TN) and l) dissolved organic nitrogen (DON) in surface water (marked blue) and bottom water (marked orange) in Hornsund, Isfjorden, Kongsfjorden and Krossfjorden. The p-values indicate significant differences in the median concentration of the parameter between the investigated fjords.”

“Fig.5 a) Oxygen (O_2), b) pH, c) nitrate (NO_3^-), d) ammonium (NH_4^+), e) total dissolved nitrogen (TN), f) dissolved inorganic carbon (DIC), g) dissolved organic carbon (DOC), h) dissolved organic nitrogen (DON), i) dissolved silica (Si), and j) phosphate (PO_4^{3-}) in surface water (marked as blue), Arctic Water (marked orange), Winter-Cooled Water (marked green), Intermediate Water (marked pink), Local Water (marked dark grey), Transformed Atlantic Water (marked light grey) and Atlantic Water (marked red) in Hornsund, Isfjorden, Kongsfjorden and Krossfjorden. The p-values indicate significant differences in the median concentration of the parameter between the investigated fjords, presented only if statistically significant.”

“Fig.6 Distribution of a) chloride (Cl^-), b) nitrate (NO_3^-), c) ammonium (NH_4^+), d) phosphate (PO_4^{3-}), f) dissolved silica (Si), g) dissolved inorganic carbon (DIC), and h) dissolved organic carbon (DOC) in pore water in Hornsund (marked blue), Isfjorden (marked grey), Kongsfjorden (marked red) and Krossfjorden (marked yellow).”

“Fig.7 Box plots of a) chloride (Cl^-), b) nitrate (NO_3^-), c) ammonium (NH_4^+), d) phosphate (PO_4^{3-}), e) dissolved silica (Si), f) dissolved inorganic carbon (DIC), and g) dissolved organic carbon (DOC) in pore water (marked grey) and bottom water (marked orange) in Hornsund, Isfjorden, Kongsfjorden and Krossfjorden. The p-values indicate significant differences in the median concentration of the parameter between the investigated fjords.”